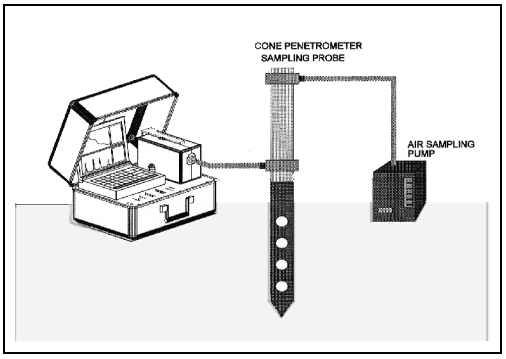
Field Portable Detection of VOCs Using a SAW/GC System

Developer: Amerasia
Contract Number: DE-AR21-94MC31177
Crosscutting Area: CMST

Subsurface Contaminants FOCUS AREA



Problem:

Field personnel are currently hampered in identifying hazardous materials and for monitoring toxic waste site cleanups. Current methods are to setup mobile laboratories with highly skilled technicians and chemists at the site or to obtain samples and transport them to a regional laboratory for identification and analysis. Either option is time consuming and expensive.

Solution:

EST, a Division of Amerasia Technology, Inc., has developed a portable, highly sensitive, rugged vapor detector system (called the Sniffer) which provides for low-cost, accurate vapor detection and analysis. Its purpose is to provide a low cost instrument for identifying hazardous materials and for monitoring DOE waste site cleanups throughout the United States.

The Sniffer has the following specifications:

- Dimensions 14 by 20 by 10 inches
- Weight 35 lb. (15.9 kg.)
- 10 second response time
- Portable testing between $30,000 to $50,000
- High Sensitivity (50 picograms, or parts per trillion)
- Wide dynamic range (20,000 minimum)
- High sample rate (5 to 20 seconds)
- Low detection threshold (parts per trillion)
- Fast column settling time (5 seconds)
- Eight hour operation with a refill helium gas carrier

The following selected compounds and their chemical properties are not inclusive of all of the substances eligible for analysis.

Constituent	Minimum Detection Limit (ppb)
Trichloroethylene	40
Tetrachloroethylene	10
Carbon Tetrachloride	410
Chloroform	420
Dichloromethane	600
1,2-Dichloroethane	370
1,1,1-Trichloroethane	3,570
1,1-Dichloroethylene	1,110
1,1,2,2-Tetrachloroethane	3
Trichlorofluoromethane	25,640
Benzene	240
Toluene	19
Gasoline	10-100
Diesel Fuel	1

Benefits:

‣Based upon the application, responds to both vapor and particle material media.

‣Can be configured for stand alone uses or integrated with other systems.

‣Can be used in the lab or on-site.

‣Can be used in water, soil, vapor and particle mediums and is

expected to be used in the following situations:

User: EPA/DOE Environmental Monitoring
Technology Application: chemical processes, fugitive emissions, OHSA/CAAA materials, environmental monitoring to include surface, subterranean, and atmospheric monitoring

User: Industrial Monitoring
Technology Application: stack emissions, dioxins, particle chemical processes, incineration, and continuous emission monitoring (CEM), toxic gas, combustibles, oxygen depletion

User: Law enforcement, military
Technology Application: contraband, drugs, explosives, lethal chemicals, toxic gas warfare

Technology:

The Sniffer utilizes a patented piezoelectric Surface Acoustic Wave (SAW) resonator device and capillary gas chromatography. The result is a portable system that provides high detection specificity, selectivity, and sensitivity. The SAW resonate sensor has excellent recovery characteristics and provides a trace analysis in less than 30 seconds.

The figure displays the Sniffer attached to a cone penetrometer sampling tube for ground sample analysis. The Sniffer consists of a portable gas chromatograph (GC) a SAW sensor, and a dynamic particle/vapor capture head. The three components are shock mounted in a rugged field-portable fiberglass carrying case. The Sniffer captures the sample in a cyrogenic focus chamber. The chamber deposits the sample upon the SAW sensor. The SAW sensor determines the change in its mass density and reports it to the database maintained in a laptop computer.

The Sniffer database identifies the suspect sample through an analysis of the numerous chemical signatures it has previously identified and recorded. The analysis is then displayed with both visual and numerical data results. The operator also has an electronic scratch pad to enter any notes or comments. The system uses software (developed by Amerasia) which integrates a proprietary database system with Microsoft Windows.

Contacts:

For information on this project, the contractor contact is:

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DOE's Morgantown Energy Technology Center supports the Environmental Management - Office of Science and Technology by contracting the research and development of new technologies for waste site characterization and cleanup. For information regarding this project, the DOE contact is:

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